

**In the Claims:**

Claims 1-20. (Cancelled).

21. (Currently amended) An apparatus for use in a vertical shaft melting furnace having a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void, and further having a plurality of burners that are ~~operative~~ configured to fire into the shaft in a bottom region of the shaft, the apparatus comprising:

a device that is ~~operative~~ configured to direct a jet of hot gas into the shaft in an upper region of the shaft in a non-radial direction, whereby the non-radial jet of hot gas can induce a swirl to disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft.

22. (Original) An apparatus as defined in claim 21 wherein the non-radial direction is inclined downward from horizontal.

23. (Currently amended) An apparatus as defined in claim 21 wherein the device is one of a plurality of devices that are ~~operative~~ configured to direct jets of hot gas into the shaft in the upper region of the shaft in non-radial directions that together extend in a common direction circumferentially around the inside of the shaft.

24. (Original) An apparatus as defined in claim 21 wherein the device is an upper burner, and the non-radial jet of hot gas comprises an upper jet of combustion products generated by the upper burner.

25. (Currently amended) An apparatus as defined in claim 24 wherein the upper burner is one of a plurality of upper burners that are ~~operative~~ configured to fire into the shaft in the upper region of the shaft in non-radial directions.

26. (Original) An apparatus as defined in claim 25 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.

27. (Currently amended) An apparatus as defined in claim 24 wherein the plurality of burners that are ~~operative~~ configured to fire into the shaft in the bottom region of the shaft are premix burners and the upper burner is a nozzle mix burner.

28. (Currently amended) An apparatus as defined in claim 24 wherein each of the plurality of burners that are ~~operative~~ configured to fire into the bottom region of the shaft is ~~operative~~ configured to fire with a first individual heat input, and the upper burner is ~~operative~~ configured to fire with a second, lower individual heat input.

29. (Currently amended) An apparatus as defined in claim 28 further comprising a control system that is ~~operative~~ configured to fire each of the plurality of burners with the first individual heat input, and to fire the upper burner with the second, lower individual heat input.

30. (Currently amended) An apparatus as defined in claim 21 wherein the device is an upper burner and the non-radial jet of hot gas comprises an upper jet of combustion products generated by the upper burner, and further comprising a plenum that communicates the upper burner with the shaft such that the upper burner is ~~operative~~ configured to fire into the plenum, and multiple upper jets of combustion products are directed from the plenum into the shaft in the upper region of the shaft, when the upper burner is fired.

31. (Original) An apparatus as defined in claim 30 wherein the plenum is configured to direct the upper jets of combustion products into the upper region of the shaft in non-radial directions.

32. (Original) An apparatus as defined in claim 31 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.

Claims 33 - 40.(Cancelled).

41. (Currently amended) An apparatus for use in a vertical shaft melting furnace having a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void, and further having a plurality of burners that are ~~operative~~ configured to fire into the shaft at a plurality of vertically spaced levels, the apparatus comprising:

a burner that is ~~operative~~ configured to direct a jet of combustion products into the shaft at an uppermost level in a non-radial direction, whereby the non-radial jet of combustion products can induce a swirl to disperse a concentrated channel of combustion products rising through a void in unmelted portions of a load of metal pieces in the shaft.

42. (Original) An apparatus as defined in claim 41 wherein the non-radial direction is inclined downward from horizontal.

43. (Currently amended) An apparatus as defined in claim 41 wherein the burner is one of a plurality of burners that are ~~operative~~ configured to direct jets of combustion products into the shaft at the uppermost level in non-radial directions.

44. (Original) An apparatus as defined in claim 43 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.

Claims 45 – 56.(Cancelled)

57. (Currently amended) An apparatus for use in a vertical shaft melting furnace having a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void, and further having a plurality of burners that are ~~operative~~ configured to fire into the shaft in a bottom region of the shaft, with each of the plurality of burners being ~~operative~~ configured to fire with a first individual heat input, the apparatus comprising:

an upper burner that is ~~operative~~ configured to fire into the shaft in an upper region of the shaft with a second, lower individual heat input, whereby the upper burner can disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft.

58. (Currently amended) An apparatus as defined in claim 57 wherein the upper burner is ~~operative~~ configured to fire into the shaft in the upper region of the shaft in a direction inclined downward from horizontal.

59. (Currently amended) An apparatus as defined in claim 57 wherein the plurality of burners that are ~~operative~~ configured to fire into the bottom region of the shaft are premix burners, and the upper burner is a nozzle mix burner.

60. (Currently amended) An apparatus as defined in claim 57 further comprising a control system that is ~~operative~~ configured to fire each of the plurality of burners with the first individual heat input, and to fire the upper burner with the second, lower individual heat input.

61. (Currently amended) An apparatus as defined in claim 57 wherein the upper burner is one of a plurality of upper burners, each of which is ~~operative~~ configured to fire into the shaft in the upper region of the shaft with the second, lower individual heat input.

62. (Currently amended) An apparatus as defined in claim 57 further comprising a plenum that communicates the upper burner with the shaft such that the upper burner is ~~operative~~ configured to fire an upper jet of combustion products into the plenum, and multiple upper jets of combustion products are directed from the plenum into the shaft in the upper region of the shaft, when the upper burner is fired.

- 63. (Original) An apparatus as defined in claim 62 wherein the plenum is configured to direct the upper jets of combustion products into the shaft in the upper region of the shaft in non-radial directions.
- 64. (Original) An apparatus as defined in claim 63 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.